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AMENDMENTS TO THE SPECIFICATION

Please replace paragraph [0017] with the following amended paragraph:

[0017] After the state equation is determined, an adjoint optimization procedure ~~is defining~~ is then implemented to identify the model parameters (104-110). Adjoint analysis is a mathematical tool that is used to determine the gradient information that is central to efficient high-dimensional optimization strategies. Although adjoint analysis has been used previously to conduct control input optimization, it has not been used to conduct model parameter identification, which is the subject of the present invention. As FIG. 1 indicates, the first step in the adjoint analysis procedure includes determining a cost function that represents the performance objective for the process (104). A generalized expression of the cost function is shown below.

$$\tau = \frac{1}{2}\int_0^T |C\mathbf{q}-\mathbf{y}| * Q|C\mathbf{q}-\mathbf{y}|dt + \frac{1}{2}|C_o\mathbf{q}_o-\mathbf{y}_o| * R_o|C_o\mathbf{q}_o-\mathbf{y}_o| + \frac{1}{2}|\theta-\bar{\theta}| * \bar{R}|\theta-\bar{\theta}| \qquad (2)$$

In the context of the present embodiment, the objective is output validation of the model to ensure the parameters were correctly determined. The error between the model output $C\mathbf{q}$ and the measured data $\mathbf{y}$ is penalized by adjusting the weighting matrix Q. Moreover, since the measured data includes noise, the single sample for the initial condition $\mathbf{q}_o$ cannot be provided with 100% certainty. Hence, the model initial conditions are permitted to vary by adjusting the weighting matrix R_o. The parameter values can be constrained near reference values $\bar{\theta}$ by adjusting the cost weighting matrix $\bar{R}$.

Please replace the ABSTRACT with the following amended ABSTRACT:

A method ~~is provided for identifying the unknown parameters of a non-linear dynamic system model that has one or more system inputs. The~~ for non-linear dynamic model parameter identification includings deriving the governing state equation ~~is derived~~ from the non-linear dynamic system model. An adjoint equation is determined from the governing state equation, and a perturbation cost function is determined, based at least in part on the

determined adjoint equation. Changes in the perturbation cost function that result from incremental changes in one or more of the system inputs and from arbitrarily chosen values of one or more of the unknown model parameters are iteratively determined to thereby identify the unknown model parameters.